35 centavos a copy
₱3.00 a year

The Philippine Agriculturist

Foreign subscription
$2.00 a year

Entered at the Post-Office at Los Baños, Laguna, as second-class mail-matter

LEOPOLDO B. UICHANCO, M.S., Editor-in-Chief
GERARDO O. OCFEMIA, B. Agr., FRANCISCO O. SANTOS, A. B., Assistant Editors
NEMESIO B. MENDIOLA, Ph. D., Business Manager
ANTONIO CHANCO, Assistant Business Manager

VOL. VII SEPTEMBER, 1918 No. 2

EDITORIAL

The College of Agriculture is grateful, as ever, to the Farmers' Congress for again sending here this year a delegation to visit the institution and restrengthen the old bonds of cordial relationship that has been existing between that important organization and this college, as well as to find out in what way or ways the farmers, as a body, may be of help to us, and we to them. The efforts of the College of Agriculture are directed primarily to training Filipino young men in the methods of scientific agricultural practice, so that after graduation, they may go out among their people and serve as an effective agency to the country-wide dissemination of principles conducive to more profitable farming. On the success or failure of these young men the future of Philippine agriculture will depend to a large extent.

This college, therefore, is the farmers' own college, and it is on them that the institution largely counts for moral support. We constantly need their cooperation; and if there be anything wrong which can be remedied by proper action, or if there be any measure needed to enable the college to keep pace, as far as practicable, with the progress of modern science, it is to the farmers that we should first appeal. We believe that they, above all others, are qualified to interpret the actual situation properly and to voice our needs to the authorities concerned with the government of the college. When they come, therefore, either as a body in the form of a delegation from the Farmers' Congress, or as individual farmers visiting the College of Agriculture and we request them to listen to and consider our various requirements, we know that they always regard our concerns in the light of affairs in which they are directly and vitally involved.

We invite the farmers to come and visit the College of Agriculture oftener; and we assure them of a warm and hearty welcome, both on the part of the faculty and of the student body. The annual exposition of this college will be held this year from November thirtieth to December first, and since college events, like these, are held principally for the farmers, in order that we may have an opportunity to acquaint them with the work of this institution and to become acquainted with them, we hope that they will honor the occasion with a large attendance.

The Production of Grain and Stalks by Maize as Affected by Intercropping with Legumes

By Basilio R. Bautista

Thesis presented for graduation from the College of Agriculture, No. 94.

INTRODUCTION

The growing of two crops together on the same land would appear to offer the possibility of a number of advantages, especially when one of these crops is a legume. The increase in the fertility of the soil brought about by the fixation of atmospheric nitrogen by the legume might result in an increased production by the other crops. It is also possible that the physical condition of the soil might be improved by the accumulation of humus, if the legume were plowed under. Such a combination of crops would also appear to offer a means of controlling weeds and possibly of checking the spread of plant diseases and pests. On the other hand, it would seem by no means certain that intercropping would always be advantageous, since it is quite possible that the subsidiary crop might retard the growth of the principal crop, in the same way that weeds do, by interference with light, or even by harmful action upon the soil. It seemed desirable, therefore, to determine by field tests, under local conditions, the value of such a system of interplanting. The experiments here reported aimed to find out the effect of intercropping with various legumes on the production of grain and stalks by maize. Both the immediate effect and the effect upon a succeeding crop of maize were studied, and a comparison was made between wet-season and dry-season plantings.

EXPERIMENTS AND RESULTS

The experiments here considered consisted of four series of tests, which may be designated as Test 1, Test 2, Test 3 and Test 4. In Test 1 the immediate effect of the legumes upon the yield of maize was studied by a planting during the rainy season of 1916. Test 2 consisted in a repetition, during the dry season, of the first test, while Test 3 consisted in a repetition during the following rainy season, in 1917. In Test 4 maize alone was grown on the land used in Test 3, in order to determine whether the intercropping benefited a succeeding crop of maize.

TEST 1

The seed of yellow flint corn was obtained from San Antonio, a barrio of Los Baños, near the College of Agriculture. Ears that were straight, free from disease, and which conformed to the type as nearly as possible were selected. The butt and tip grains of each ear were discarded as being unsuited for seed. The legumes tested were cowpea, mungo, tepary bean, and soy bean. The seeds of the legumes were secured at the college. The seed of the tepary bean had been recently imported. The land used for the first test consisted of four fields, one of which was on a hillside near the water-boiling plant, and the other three were on level ground. Field I was near the coconut grove. The soil was a sandy loam, which had previously been planted with corn. This field was adjacent to a ditch, and during the rainy season the lower part (planted with maize alone) was covered with water, which proved rather detrimental to the plants. Field II was near the banana plantation, on level ground with clay-loam garden soil. It was formerly planted with corn. Field III was situated near the main building. This field was shallow, with adobe rock underneath, and its

surface was slightly sloping. It had previously been planted with legumes. Field IV, near the water-boiling plant, was located on a hillside formerly planted with yautia and gabi.

Each of these fields was divided into four plots. The first plot was planted with maize alone, and was considered as the control. The second, third, and fourth plots were planted with maize intercropped with mungo, cowpea, and tepary bean, respectively.

The methods of ground preparation were the same in all cases. The ground was first broken up with a large plow drawn by three vacas, and the plowing was followed with disc harrow. The disc harrow was followed by a bamboo harrow. The fields were allowed to stand for about a week to permit further soil aëration and to give a chance for light showers to soften the uncrushed clods. At the end of this time the ground was again plowed, using this time an ordinary plow, and the plowing was again followed by harrowing with the disc harrow and the bamboo harrow.

Each section of the field was divided into four plots, one of which was used as the control, and the other three were marked for planting legumes. Each plot had an area of 350 square meters, and the plots were separated by paths, 2 meters wide. Each plot was marked off into furrows one meter apart and about 12 centimeters deep.

The corn was planted at a distance of one meter between the hills. Three or four seeds were planted in each hill, and then covered to a depth of about 5 centimeters. Immediately after planting the corn, the legumes were planted 33 1/3 centimeters apart, with 4 or 5 seeds to each hill.

When the corn plants reached a height of 50 centimeters, they were thinned out to two plants to each hill. At the same time the legumes were also thinned, leaving 3 plants on a hill.

As soon as the weeds began to show signs of growth, a cultivator was run between the rows. This cultivation killed the weeds and established surface mulch. Surface mulching was repeated periodically.

When all of the plants were fully mature, they were harvested. This was done by cutting the plants close to the ground. The plants from each plot were weighed and counted separately. Then the ears were husked and weighed.

The legumes were harvested earlier than the corn, and subsequently dried in the sun. Threshing was done by placing the dried pods in bags and pounding them. After separating the seeds from the pods, the seeds were again dried in the sun. The legume vines were left in the field and were plowed under in order to improve the soil.

As has been mentioned, Test 1 was carried out during the rainy season of 1916. Tables I and II show the results secured from different plots in each of the four fields. The hectare and kilogram were used as the bases of computation. The computations for corn were made on the basis of 20,000 plants to a hectare (allowing two plants on a hill). The area of each plot was 350 square meters. The yields of legumes per hectare were computed on the basis of their actual production per plot. The value of the legume seeds, as will be seen in Tables I and II, was the net value per hectare. In Plot IV of each field the tepary beans died soon after germination. The effect of the legumes on that plot was not considered and the plot is used as control in the discussions which follow.

An inspection of the yield data for Field I (Tables I and II) shows that the average control is greatest in produc-

tion of shelled corn and of stalks. In total value of the crop the plot with cowpea showed a gain of ₱90.365, over the average value of the maize alone in the control plots. The mungo plot showed a loss of ₱24.928. In shelled corn alone, the average control gave the highest money value, the cowpea came second, and the mungo last. In legume seeds alone, cowpea gave the highest money value.

In Field II the average control plot gave the highest production and the highest money value of stalks and of shelled corn. The mungo plot was second to the control in shelled corn, but was the lowest of all in stalk production. The stalk production was highest in the control plot. The total value of the crop from the cowpea plot was ₱63.972 less per hectare, than the average value of the maize in the control plots.

In Field III the mungo plot showed an increase in the shelled corn and a decrease in stalks, when compared with the control, but gave the highest money value and net profit. The cowpea plot showed an increase over the control in stalk and in shelled corn yield. The control plot was the lowest in shelled corn production and in total value of the crop. In stalk yield, the mungo was lower. The cowpea plot gave the lower net profit of the two legume plots.

In Field IV the cowpea plot showed an increase in both stalks and shelled corn. The mungo plot exhibited an increase in shelled corn and in stalks, when compared with the control. It also had a high production of legume seed. The mungo plot surpassed the average of the control plots in the value of its total yield. The cowpea plot showed an increase of ₱96.43, the total value of its yield.

TEST 2

In the second test, two new fields were used, and each field had only 3 plots, because of the limited supply of seed of legumes. Mungos and cowpeas were the only legumes used. As has been stated, this test was carried out during the dry season of 1916.

Field I was composed of ordinary garden soil mixed with little fragments of adobe. About one-third of the field was slightly elevated above the remaining portion. This field was formerly planted with corn. Field II was a sandy loam and was formerly occupied by rice.

The treatments of the field in the way of preparation, planting, etc., were the same in all respects as in Test I. The results secured from this planting are given in Tables II and IV.

An examination of these tables shows that, in Field I, the mungo plot gave a lower yield in both stalks and shelled corn than did the control. Considering the money value of both shelled corn and the legume seed, this mungo plot showed a profit; but if the value of the shelled corn alone is considered, there was a loss. The cowpea plot was slightly lower in stalk production but slightly higher in shelled corn than the mungo plot. It fell below the control in both stalks and shelled corn; but taking the money value of the cowpea seed and the shelled corn together, it gave the highest net profit.

In Field II the mungo plot showed a decrease in stalk production but an increase in shelled corn, when compared with the control. The cowpea plot had an increase in both shelled corn and stalks, and ranked first among all the plots in the total value of the crop harvested from it.

TEST 3

Test 3, which was run during the rainy season of second year (1917), had only one field, and this was different from those used in the two preceding tests. The area was almost equal to the fields used in the former tests. This field had 4 plots, each of which had an area of 840 square meters. It was formerly occupied by sugar cane. The object of this test was the same as that of the two preceding tests, namely to find out the immediate effect of legumes, such as cowpea, mungo, and soy bean, on the production of both grain and stover. The field used in this test was used later in Test IV to determine the effect upon a succeeding crop of maize. The soil was an ordinary garden loam.

The results of Test 3 are shown in Tables V and VI. Inspection of these tables shows that the control plot gave the highest yield in shelled corn. The mungo plot gave a lower yield in shelled corn than the control, but gave a higher yield of stalks. The cowpea ranked next to the mungo in stalk production, but gave the lowest yield of shelled corn. Considering the money value of the shelled corn and legumes together, the cowpea plot came first. The soy bean plot ranked the lowest in stalk production, but third in shelled corn. On the whole, the soy-bean plot showed a loss in money value. This is principally due to the fact that no legume seed was obtained from it.

TEST 4

The field used in Test 3 was used in this test. The object was to find out the remote effect of mungo, soy bean and cowpea on the production of both stalks and shelled corn. Table VII shows the results obtained in Test 4.

This table shows that the plot which had previously been intercropped with cowpea ranked first in both stalks and shelled corn. The plot on which mungo had been used as a subsidiary crop was second in yield of shelled corn, but less than the others in stalk production. It would seem from this experiment that the cowpea has a beneficial effect upon a crop of corn that succeeds it on the land. Mungo was beneficial in increasing the production of shelled corn. It is surprising that no beneficial effect was observed in plot which had previously been planted with soy bean.

CONCLUSIONS

1. Legumes had only a remote beneficial effect, if any, on either stalk or shelled corn production, in these tests.

2. When a legume (mungo, cowpea, etc.) is intercropped with corn the value of the legume crop usually more than counter-balanced the decrease in production of the corn. For this reason, growing a legume and corn side by side may possess a decided advantage over growing corn alone. But corn should not be intercropped with legumes solely for the purpose of furnishing the corn with nitrogenous fertilizer.

3. Cowpeas seem to be better soil renovators and weed controllers than the other legumes here tested.

ACKNOWLEDGMENT

The writer expresses his thanks to Professor C. F. Baker, Assistant Professor M. L. Roxas and Assistant Professor Jos. A. Cocannouer for their helpful suggestions and assistance in the preparation of this thesis.

TABLE I

RESULTS OF FIRST PLANTING CORN COLL. No. 5986.

TEST I.

	Legumes Intercultured	Date of Planting	Date of Maturity	Actual Wt. of Corn per plot		No. of plants per plot	Yield per Ha. in Kilograms			Estimated money value of shelled corn per Ha.	Value of shelled corn. Average of control.
				Ears	Stalks		Ears	Stalks	Shelled corn		
FIELD I											
Plots 1	Control.....	20-V-16	2-IX-16	105.42	177.18	530	3978.000	6686.037	3094.000	₱232.050	
2	Mungo.....	"	"	98.47	159.00	522	3772.000	6091.954	2934.385	220.078	
3	Cowpea.....	"	"	104.47	162.73	533	3920.075	6106.191	3048.947	228.671	₱247.186
@ 4	Tepary..... bean	"	Did not survive	73.75	96.05	328	4496.951	5856.707	3497.628	262.322	
FIELD II											
Plots 1	Control.....	20-V-16	2-IX-16	177.09	243.31	676	5239.349	7198.520	4075.049	305.628	
2	Mungo.....	"	"	173.48	131.12	653	5313.323	4015.926	4132.584	309.943	
3	Cowpea.....	"	"	134.05	194.35	614	4366.449	6330.618	3285.015	246.376	335.147
@ 4	Tepary..... bean	"	Did not survive	172.54	238.46	552	6251.449	8639.855	4862.238	364.667	
FIELD III											
Plots 1	Control.....	27-V-16	19-IX-16	124.57	143.43	718	3469.916	3995.264	2698.823	202.411	
2	Mungo.....	"	"	158.13	79.47	766	4128.720	2074.934	3211.226	240.841	
3	Cowpea.....	"	"	148.06	252.94	763	3880.996	6630.144	3018.552	226.391	222.483
@ 4	Tepary..... bean	"	Did not survive	164.38	204.62	790	4161.518	5180.253	3236.736	242.755	
FIELD IV											
Plots 1	Control.....	27-V-16	19-IX-16	114.89	153.31	607	3785.502	5051.400	2944.279	220.820	
2	Mungo.....	"	"	99.16	163.54	602	3294.352	5436.544	2562.273	192.170	
3	Cowpea.....	"	"	119.07	144.93	536	4442.910	5407.835	3455.596	259.169	192.143
@ 4	Tepary..... bean	"	Did not survive	85.89	120.11	613	2802.283	3918.760	2179.553	163.466	

@ Since the tepary bean died soon after germination, these plots are considered as control plots.
Unit of weight = kilo.
Corn at Manila market = ₱7.50 per 100 kilos.
1 kilo = ₱.075.

TABLE II
RESULTS OF FIRST PLANTING LEGUMES
TEST I

	Legumes used	Date of planting	Date of Maturity	Actual Wt. of yield in Kg. Pods	Seeds	Labor spent	Yield of seeds per hectare	Cost of Labor	Net value of seeds	Corn and Value of corn and legumes	Legumes Gain or Loss @	
FIELD I												
Plots 1	Control.....	——	——	——	——	——	——	₱.....	₱ ..	₱232.050	₱.....	
2	Mungo.....	12-VI-16	22-VIII-16	.870	.480	½hr.	13.714	1.428	2.180	222.258	24.928—	₱247.186
3	Cowpea.....	"	"	6.580	4.160	2 hr.	118.857	5.714	108.880	337.551	90.365+	
4	Tepary..... bean	"	Did not survive	——	——	——	——	——	——	262.322	——	
FIELD II												
Plots 1	Control.....	——	——	——	——	——	——	——	——	305.628	——	
2	Mungo.....	13-VI-16	25-VIII-16	.970	.740	½ hr.	21.142	1.428	4.135	314.078	21.069—	₱335.147
3	Cowpea.....	"	"	1.530	1.100	1 hr.	31.428	2.857	24.799	271.175	63.972—	
4	Tepary..... bean	"	Did not survive	——	——	——	——	——	——	364.667	——	
FIELD III												
Plots 1	Control.....	——	——	——	——	——	——	——	——	202.411	——	
2	Mungo.....	12-VI-16	25-VIII-16	——	——	——	——	——	——	240.841	18.258+	₱222.583
3	Cowpea.....	"	"	——	——	——	——	——	——	226.391	3.808+	
4	Tepary..... bean	"	Did not survive	——	——	——	——	——	——	242.755	——	
FIELD V												
Plots 1	Control.....	——	——	——	——	——	——	——	——	220.820	——	
2	Mungo.....	13-VI-16	24-VIII-16	1.390	.990	1 hr.	28.285	2.857	4.586	196.756	4.613+	₱192.143
3	Cowpea.....	"	"	1.870	1.340	1½ hr.	38.285	4.285	29.405	288.574	96.431+	
4	Tepary..... bean	"	Did not survive	——	——	——	——	——	——	163.466	——	

@ The values followed by a + sign indicate gains, while those followed by — sign indicate loses.

Calculations for cowpea are made on the basis of the U. S. market value of ₱0.40 per lb., or ₱0.88 per kilo. There is no local market for the seeds in the Philippines.

Calculations for mungo seeds made on the basis of the Los Baños market value of ₱0.20 per liter, or ₱0.20 per 0.76 kilo.

TABLE III

RESULTS OF SECOND PLANTING CORN COLL. No. 5986F$_1$

TEST 2

	Legumes Intercultured	Date of Planting	Date of Maturity	Actual Wt. of corn per plot: Ears	Actual Wt. of corn per plot: Stalks	No. of plants per plot	Yield per Ha. in Kilograms: Ears	Yield per Ha. in Kilograms: Stalks	Yield per Ha. in Kilograms: Sheded corn	Estimated Money value of shelled corn per Ha.
FIELD I										
Plots 1	Control.....	14-XI-16	2-III-17	65.00	72.40	553	2350.813	2618.444	1829.410	₱137.205
2	Mungo.....	"	"	55.60	54.70	544	2044.117	2011.029	1589.868	119.240
3	Cowpea.....	"	"	55.60	53.00	543	2047.882	1952.117	1592.797	119.459
FIELD II										
Plots 1	Control.....	22-XI-16	11-III-17	43.80	44.00	690	1269.565	1275.362	987.439	74.057
2	Mungo.....	"	"	44.40	40.00	636	1396.226	1257.861	1085.953	81.446
3	Cowpea.....	"	"	43.20	34.40	300	2880.000	2293.333	2240.000	168.000

TABLE IV

RESULTS OF SECOND PLANTING LEGUMES

TEST 2

	Legumes used	Date of Planting	Date of Maturity	Actual Wt. of yield in Kilogram: Pods	Actual Wt. of yield in Kilogram: Seeds	Labor spent	Yield of seed per hectare	Cost of Labor	Values of seeds	Corn and Legumes: Value of corn and legumes	Corn and Legumes: Gain or Loss
FIELD I											
Plots 1	Control.....	——	——	——	——	——	——	₱.....	₱.....	₱137.205	₱.....
2	Mungo.....	18-XI-16	7-II-16	7.39	5.820	3 hrs.	166.285	8.471	35.188	154.428	17.223+
3	Cowpea.....	"	20-II-16	14.95	9.98	8 hrs.	285.142	22.857	228.067	347.526	210.321+
FIELD II											
Plots 1	Control.....	——	——	——	——	——	——	——	——	74.057	——
2	Mungo.....	22-XI-16	24-II-17	1.31	.91	1 hr.	26.000	2.857	3.985	85.431	11.374+
3	Cowpea.....	"	23-II-17	14.60	8.27	7 hrs.	236.285	20.000	187.930	355.930	281.873+

TABLE V
RESULTS OF THIRD PLANTING CORN COLL. No. 5986F$_2$
TEST 3

	Legumes Intercultured	Date of Planting	Date of Maturity	Actual Wt. of corn per plot		No. of Plants per plot	Yield per Ha. in Kilogram			Estimated Money value of shelled corn per Ha.
				Ears	Stalks		Ears	Stalks	Shelled corn	
Plots 1	Control.....	19-V-17	26-VIII-16	162.00	502.80	1657	1955.340	6068.799	1520.820	₱114.061
2	Mungo.....	"	"	160.00	346.00	1680	1904.762	6500.000	1481.481	111.111
* 3	Soy bean.....	"	"	130.60	449.40	1565	1669.009	5743.130	1298.118	97.358
4	Cowpea.....	"	"	82.80	407.50	1306	1267.993	6240.428	986.216	73.966

TABLE VI
RESULTS OF THIRD PLANTING LEGUMES
TEST 3

	Legumes used	Date of Planting	Date of Maturity	Actual Wt. of plot in Kilogram		Labor spent	Yield of seeds per hectare	Cost of Labor	Value of seeds	Corn and Legumes	
				Pods	Seeds					Value of corn and Legumes	Gain or Loss
Plots 1	Control.....	——	——	——	——	——	——	₱.....	₱.....	₱114.061	₱.....
2	Mungo.....	19-V-17	12-VIII-16	7.23	4.40	7 hrs.	52.380	8.333	5.451	116.562	2.501+
* 3	Soy bean.....	"	——	——	——	——	——	——	——	97.358	16.703—
4	Cowpea.....	"	12-VIII-16	17.05	10.39	8 hrs.	123.690	9.523	99.324	173.290	59.229+

* Soy bean was plowed under when it reached maturity. The soil was needed very badly for the next planting.

TABLE VII
RESULTS OF FOURTH PLANTING CORN COLL. No. 5986F$_3$
TEST 4

	Legumes Intercultured	Date of Planting	Date of Maturity	Actual Wt. of corn per plot		No. of plants per plot	Yield per Ha. in Kilograms			Estimated money value of shelled corn per Ha.	Value of shelled corn
				Ears	Stalks		Ears	Stalks	Shelled corn		
Plots 1	Control.....	19-X-17	26-I-18	86.40	184.00	1478	1169.147	2489.851	909.336	₱68.200	
2	Mungo.....	"	"	77.60	112.80	1276	1216.300	1768.025	946.011	70.950	₱ 2.75 +
3	Soy bean.....	"	"	50.60	90.20	1990	1022.222	1822.222	795.061	59.629	8.571—
4	Cowpea.....	"	"	90.00	150.40	1173	1534.526	2564.364	1193.520	89.514	21.314+

Experiments on the Effect of Certain Philippine Feeds on Growth and Production of Eggs and Meat by Poultry

By Florentino F. Cruz

Thesis presented for graduation from the College of Agriculture, No. 82.

THE METHODS OF HANDLING POULTRY IN THE PHILIPPINES

Chickens are raised in almost every place in the Philippines, but with all this widespread presence of poultry there is no organized poultry business.

The native methods of raising poultry are usually crude and show lack of system. Chickens are not properly housed, and they are allowed to roam around and seek their own food as best they can. Tops of houses and trees around them serve as roosts, and the fowls are consequently exposed to rains, storms, and other enemies. Very little attention is given to the proper selection of breeding fowls, with the result that no progress whatever has been made in developing high grade flocks.

One of the greatest drawbacks to the proper development of the poultry business in the Philippines is the lack of knowledge of poultry sanitation.

Very few native poultry raisers in the Philippines give proper care to their laying hens. The hens lay their eggs in nests made of bamboo baskets which are hung at different places around the dwelling houses out of the reach of disturbing animals. The gathering of the eggs is very irregular; setting hens are allowed to remain on the same nests as the laying hens, with the result that the heat from their bodies starts the incubation of the newly laid eggs. The number of baskets is usually much smaller than is necessary.

Young chicks, just as older ones, are also improperly cared for as to feeding, diseases, and enemies. When newly hatched, they are not given soft diet but are immediately given cracked rice or corn. This is their diet for a day or two, after which time they are given unground rice or are allowed to eat the same food as is given to the adults. Young chicks are usually confined a day or two after hatching until they are strong enough to wander with their mother. Then begins the irregularity of feeding. They may or may not be given food every day. The young chicks have to depend upon whatever food they, with their mother, can find around the premises. Some mother hens lead their flocks far from home and consequently only a small per cent of the brood ever reaches maturity owing to the countless enemies which they meet. The chicks also suffer from diseases, which carry them off in great numbers while they are still young. There is practically no attempt made to isolate the infected ones from the healthy ones.

THE ECONOMIC IMPORTANCE OF POULTRY CULTURE IN THE PHILIPPINES

The Philippines are now entering a period of development when special efforts are being made to make the Islands less dependent upon other countries and more dependent upon themselves. The proper development of the poultry industry will help very materially in bringing this about. The Philippines import poultry products from China and other countries at a sum amounting to an average of ₱739,302 a year.

There is a great need for the development of a real poultry business in these Islands. This can be accomplished without great difficulty and the retention of the thousands of pesos spent annually

for foreign poultry products will certainly be a wise step toward national economy.

Before going further, it is well to take up here a general discussion of the recognized advantages of the poultry industry:

First.—Even with small capital the business can be started and conducted successfully. It is usually wise to begin on a small scale and to learn the business thoroughly by degrees.

Second.—Poultry work may be carried on at all seasons of the year. Certain seasons are more favorable than others, but if the work is properly handled, a profit can be made at any time of the year.

Third.—Only a limited amount of land is required for the business.

Fourth.—Quick returns can be obtained.

Fifth.—The demand for poultry products is great in the Philippines and goods eggs command a top price at almost all times. As the methods of transportation improve, dependence can be placed on the home products, and poultry raising will become even more sure of success.

The Philippines is a country naturally favorable for the development of this industry. During practically the entire year we have plenty of green feeds, one of the most important features in the production of poultry; and insects are plentiful as a source of protein food. The cost of houses is also low as compared with other countries, since they do not have to be built very solid and nearly all materials for construction can be obtained locally and cheaply.

METHODS OF IMPROVEMENT

Before the poultry business can be improved in this country, the following should be given due and thoughtful consideration:

1. Proper housing and appliances that will insure the health and safety of the fowls should be provided.

2. The crude methods of care, management, and feeding should be abandoned entirely. More appropriate methods, such as have already proved beneficial in other countries should be adopted as our guide.

3. There should be a widespread knowledge of poultry diseases and pests and of their prevention and eradication. A lack of knowledge of this part of the business will always keep the poultry grower on the verge of failure and discouragement.

4. Pure-bred roosters should always be kept with the flock and proper grading practiced. This phase of breeding work is the cheapest means of developing high grade stock and is within the means of every farmer.

OBJECT

The object of this investigation is a study of the methods and feeds used in native poultry work, and the possible improvements to be effected by grading, by systematic feeding, and by better methods of handling. During the corn season the native farmer feeds only corn, and during the rice season only rice. The investigation has been confined to two grades and native fowls,—the only stock available,—and to three classes of feeds.

MATERIALS

For this work, thirty brown native hens, fifteen Black Orpington mestizo hens, fifteen White Leghorn mestizo hens, two native roosters, five Black Orpington mestizo roosters, two White Leghorn mestizo roosters and three pure White Leghorn roosters were used. Twenty of the native hens were purchased by the College of Agriculture from Montalban, Rizal, and the remain-

der were brought by students from their respective localities. At the beginning of this work, February 23, 1915, these native hens were of an age varying from 1½ to 2½ years. All of them were selected as to uniformity in size and color and as to characteristics conforming so far as was possible to those suggested in the Kansas Experiment Station Bulletin No. 164, which are as follows:

1. The fowl must be healthy.
2. Comb, wattles and face, red.
3. Eye bright and lustrous.
4. Neck not short, but rather medium to long.
5. Breast broad and long, sloping upward.
6. Back, long and broad.
7. Abdomen, wide and deeper than breast.
8. Shanks, well spread and rather long.
9. Tail well spread.

The Black Orpington and White Leghorn mestizo hens and roosters were raised by the Department of Animal Husbandry under the management of the writer in March, 1914. They were progeny obtained by mating native hens with the pure-bred Black Orpingtona and White Leghorn roosters purchased from Manila. The hens were a year old when this work was started.

Four modern poultry houses were used in this experiment. These are of the shed-roof type. They are of the same size, shape, equipment, and exposure and are all made of the same class of materials. The roofs are of galvanized iron, the walls of hard wood, and the floors of concrete. The front and back sides are provided with windows, covered with mesh wire, to insure proper ventilation. The house is 4.4 meters long and 3.05 meters wide. The front height is 3.6 meters and the back 2.1 meters. All these houses are equipped with perches of 5×5 centimeters in cross-section. These are set edgewise with their upper parts rounded. Under these are the dropping boards, covered with sand, to catch the dung. Wooden nests are placed under the dropping boards, and are more or less shaded. These are 51 centimeters long, 36 centimeters wide and 31 centimeters high. Arranged on one side on the floor are the feeding boxes and pans, and bamboo troughs for drinking purposes. The yard for each house is 15 meters long and 12 meters wide.

Before this work was started, these houses were each divided crosswise into two equal apartments by means of bamboo splits nailed close enough on wooden stakes, so as to prevent the passage of hens. Connecting these apartments is a door large enough to permit the collection of eggs, cleaning and feeding. Each yard was also divided into two parts by means of bamboo splits with mesh wire placed on the top.

Opposite these four modern houses the college also built a row of three cogon-and-bamboo houses. They are approximately of the same size, 4×4 meters and 2.7 meters high in front and 2 meters at the back. The ground serves as a floor. These houses are provided with the same equipment as the permanent houses. They are in yards enclosed with bamboo fences and these yards are separated from those of the other houses by mesh wire. These yards are 58 meters long and 12 meters wide.

There is also a rearing house roofed with cogon. This consists of eight pens separated from each other by mesh wire. These pens are 1¾ meters wide, 4 meters long, and 1¾ meters high. The top is covered with wire so as to protect the chicks from cats, rats, and other enemies. The floor of the house is of concrete and on one side of it is a gutter for fresh water.

The houses were numbered according to lots. One-half of the first permanent house was numbered Lot I, the second house Lot III, the third house Lots IV and VI, and the fourth house Lots VII and VIII, respectively. The first of the cogon houses was numbered Lot V, the second house, Lot IX, and the third house, Lot II.

Each of the flocks of hens was then divided into three groups, and these placed in the different lots. Each group of the native hens, consisted of ten and each of the Black Orpington and White Leghorn mestizo hens consisted of five, there being fifteen hens in each flock of these breeds.

The roosters were likewise divided and placed with the hens in the lots.

The following table shows the different lots with the respective number of hens and roosters:

TABLE I

Lots.	*Breed*	*No.*	*Breed*	*No.*
I	Black Orpington mestizo hens	5	Black Orpington mestizo rooster	1
II	Native hens	10	Native roosters	2
III	Native hens	10	White Leghorn mestizo roosters	2
IV	Black Orpington mestizo hens	5	Black Orpington mestizo rooster	1
V	Native hens	10	Black Orpington mestizo roosters	2
VI	White Leghorn mestizo hens	5	Pure white Leghorn rooster	1
VII	Black Orpington mestizo hens	5	Black Orpington mestizo rooster	1
VIII	White Leghorn mestizo hens	5	Pure white Leghorn rooster	1
IX	White Leghorn mestizo hens	..	Pure white Leghorn rooster	1

The feeding experiment began on February 23, 1915. The feeds used were corn, unhulled rice, and mungos. One group of hens in each breed was given one of these rations.

The following list shows the feed furnished the chickens in each lot:

Corn..... { Lot I, Lot II, Lot VIII

Mungo..... { Lot V, Lot VI, Lot VII

Rice..... { Lot III, Lot IX, Lot IV

In addition to the other rations, ground bone, shell, and charcoal were also given. Sorghum and rice were grown in the yards of the permanent houses, and these furnished green feed to the fowls at all times. In the yards of the cogon houses ordinary field grasses were at all times abundant and these served as green feed to the fowls there.

The feeding was done twice a day, at 6 o'clock in the morning and at 4 o'clock in the afternoon. To the native hens fed with corn and rice, 1½ liters of each were given every day. To those fed with mungos, 1 liter of the latter was given daily. As to the mestizo hens, ¾ liter of each of corn and rice and ½ liter of mungos were given daily. The mungos and corn were occasionally boiled before giving them to the fowls to avoid monotony.

THE GROWTH OF HENS AND EGG PRODUCTION

In order to find out the comparative efficiency of the different rations used, the monthly weights of the hens in all the lots were taken and the number of eggs laid per month was recorded. The experiment ran from February 23rd to December 31st, 1915, a period of 10 months.

Throughout the course of the experiment it has been observed that each

hen after laying eggs for a certain period would sit in the nest even without eggs and with a consequent loss of appetite. This is undoubtedly the cause of the large periodical decrease in weights of the hens. On the other hand, there were some hens that decreased slightly in weight due to other causes.

Table II is a summary of nine tables of monthly weighings, showing the average monthly increase or loss in weight per hen in each lot. In this table it is shown that with all the native hens, all the rations gave loss in weight. Corn gave an average monthly loss of 0.01497 kg., rice 0.00455 kg. and mungos 0.00751 kg. According to these figures, rice gave the least loss in weight and corn the largest. With the other breeds each ration gave an increase in weight. With the Black Orpington mestizo hens, rice stands the first, the increase being 0.03499 kg., mungos second, 0.01752 kg., and corn the least, 0.00674 kg. Mungos gave the highest average monthly increase, with the White Leghorn mestizo hens, 0.02636 kg., while rice gave the least. From the above figures, no definite conclusion can be drawn as to which of the three rations is the most efficient for the growth of hens.

TABLE II

AVERAGE MONTHLY WEIGHTS OF HENS

(*Figures in kilograms*)

Month	*NATIVE*			*Black Orpington Mestizo*			*White Leghorn Mestizo*		
	Lot II Corn	*Lot III Rice*	*Lot V Mungo*	*Lot I Corn*	*Lot IV Rice*	*Lot VII Mungo*	*Lot VIII Corn*	*Lot IX Rice*	*Lot VI Mungo*
February.....	Weighings began								
March.....	–0.1608	–0.0833	–0.0891	–0.1838	–0.0642	–0.0172	–0.0226	–0.0268	0.0708
April.....	0.0325	–0.0364	0.0244	–0.0394	–0.145	–0.0672	–0.0352	0.0032	–0.1664
May.....	–0.112	0.0352	–0.1639	–0.017	–0.0094	0.0120	0.0512	0.0676	0.0930
June.....	0.0756	0.0006	0.0186	–0.0046	0.0802	0.1156	–0.0214	0.0174	–0.0438
July.....	–0.0814	–0.1215	0.0407	–0.0292	0.0580	–0.1394	–0.0406	–0.027	0.0030
August.....	0.0459	0.0392	–0.0382	0.0986	–0.0376	0.0044	0.1474	–0.0968	0.1076
September.....	0.0032	–0.0546	0.0876	0.1306	–0.0760	0.1180	0.0098	0.0066	0.0934
October.....	–0.0148	0.0824	0.0433	0.1162	0.0830	0.0915	–0.0552	0.0164	0.0152
November.....	0.0312	0.0008	0.0463	–0.0516	0.0862	0.1000	0.0516	0.0180	–0.0572
December.....	0.0309	0.0921	–0.0448	0.0476	0.3747	–0.0425	0.0366	0.0804	0.1480
Average gain or loss in 10 months.....	–0.1497	–0.0455	–0.0751	0.0674	.3499	0.1752	0.1216	0.0590	0.2636
Average gain or loss per month.....	–0.01497	–0.00455	–0.00751	0.00674	0.03499	0.01752	0.01216	0.00590	0.02636

In Table II, the figures having the minus sign show decrease in weights and those having no signs show increase in weights. The figures are in kilograms.

The collection of eggs in all the lots began on March 1st, and ended December 31st. It was done regularly every day between 3 and 5 o'clock in the afternoon. The number of eggs collected from each lot every day was carefully recorded.

Table III is a summary showing the average monthly production per hen in each breed fed with each ration. The total production for 10 months shows the comparative efficiency of the different feeds. It may be noticed in these tables that mungos gave the highest production with all the three breeds and corn second.

With the native hens mungos excel corn by 3 eggs and corn and rice are almost equal. With the Black Orpington mestizo hens mungos excel corn by 11 eggs and the latter excels rice by 7 eggs. Mungos excel corn by 9 eggs with the White Leghorn mestizo hens while rice gave less than corn by 4 eggs. In connection with these figures it should be noted that the fractions have been ignored.

The above comparisons show that mungos seem to be the most efficient feed for egg production. But with the production, the relative market values of the feeds must be taken into account, for it is from these that we can find out which feed gave the greatest profit in our operations.

TABLE III

COMPARISON OF THE EFFECTS OF DIFFERENT FEEDS ON THE EGG PRODUCTION FROM DIFFERENT BREEDS BASED ON THE AVERAGE PRODUCTION PER HEN

Month	*NATIVE*			*Black Orpington Mestizo*			*White Leghorn Mestizo*		
	Corn	*Rice*	*Mungo*	*Corn*	*Rice*	*Mungo*	*Corn*	*Rice*	*Mungo*
March	8.9	10.6	4.0	13.2	9.2	8.6	10.0	9.0	6.6
April	6.5	9.8	8.8	9.0	7.6	10.2	8.4	7.0	10.4
May	4.7	3.6	7.1	6.6	6.6	6.0	3.0	6.4	6.8
June	5.0	6.9	6.9	5.2	3.8	6.2	6.8	5.4	5.4
July	7.6	6.9	7.6	4.8	5.8	5.8	7.0	6.8	7.6
August	4.5	4.2	8.2	2.0	6.0	6.2	4.0	8.8	5.8
September	7.1	7.5	3.9	3.8	5.0	2.4	5.2	5.0	4.4
October	6.5	1.55	5.66	3.6	0.5	4.25	5.2	1.8	7.0
November	7.2	5.6	8.1	7.0	5.25	11.5	4.6	1.0	9.0
December	5.0	6.0	6.1	7.4	5.25	12.0	5.0	3.8	5.6
TOTAL	63.0	62.65	66.36	62.6	55.0	73.15	59.2	55.0	68.6

The market price of mungo per cavan (75 liters) is ₱8.00, or 10.6 centavos per liter; that of corn is ₱2.50, or 3.3 centavos per liter, and of unhulled rice ₱2.75 per cavan, or 3.6 centavos per liter. Calculating from the amounts of feed given to the hens daily, the total amount of mungos consumed by the native hens fed with this ration during the experiment was 300 liters. By the native hens with corn, 306 liters of the latter were consumed, and by those with rice, 450 liters were consumed. In the case of the Black Orpington mestizo hens the total consumption was 145 liters of mungos, 153 liters of corn and 215 liters of rice. By the White Leghorn mestizo hens, the total consumption was 153 liters, 153 liters and 229.5 liters, respectively. In the lots where mortality occurred the amount of daily feed given to the fowls was decreased correspondingly. In figuring the total feeds, this decrease was taken into consideration.

From the rates per liter, the values of the feeds consumed was figured. The expenses for the native hens were, for mungo, ₱31.80, for corn, ₱10.09, and for rice, ₱16.20. For the Black Orpington mestizos the expenses were, for mungo, ₱15.37, for corn, ₱5.04, and for rice ₱7.74. The expenses for the White Leghorn mestizo hens were ₱16.21, ₱5.04, and ₱8.26 respectively.

From the total expenses, the average expense for each hen in each breed fed with each feed was obtained. The average expenses for the native hens were for mungos ₱3.18, for corn, slightly over ₱1.00, and for rice, ₱1.62. For the Black Orpington mestizo hens the

average expenses were ₱3.07, ₱1.00, and ₱1.54, respectively. For the White Leghorn mestizo hens the expenses were ₱3.24, ₱1.00, and ₱1.65 respectively.

Referring to Table III the total production of eggs from each native hen fed with mungo is 66 eggs or 5.5 dozens. At ₱0.45 a dozen, the value of this product would be ₱2.48. Comparing this value to the average expenses per hen, which is ₱3.18, there is a loss of ₱0.70. At ₱0.40 a dozen, the value of the same would be ₱2.20 and in this case there is a loss of ₱0.98. With corn, the total production per native hen is 63 or 5.25 dozens. Calculating from the above prices per dozen, the values of this product would be ₱2.36 and ₱2.10, respectively. Comparing these values to the average expenses for each hen, which is ₱1.00, there is a gain of ₱1.36 in the former and ₱1.10 in the latter. As shown in the table, the average production per native hen fed with rice is almost equal to that with corn. Using the same values of the product with corn for that with rice and comparing these with the expenses per hen, ₱1.62, the gains are ₱0.74 and ₱0.48 respectively. In the case of the Black Orpington mestizo hens, the production per hen fed with mungos is 73 or 6.08 dozens. Valued at ₱0.50 a dozen (the eggs of the Black Orpington and White Leghorn mestizo hens were always sold at this rate) this product is worth ₱3.04. Comparing this value with the average expense, ₱3.07, there is a loss of ₱0.03. With corn the average production is 62 or 5.16 dozen and is worth ₱2.58. The average expense per hen is ₱1.00. There is, then, a gain of ₱1.58. With rice the production is 55 or 4.58 dozens and is worth ₱2.29. The average expense per hen is ₱1.54. This gives a gain of ₱0.075. With the White Leghorn mestizo hens, the respective values of production at ₱0.50 per dozen are ₱2.83 with mungos, ₱2.45 with corn, and ₱2.29 with rice. The average expenses are ₱3.24 for mungos, ₱1.00 for corn, and ₱1.65 for rice. Comparing these figures with the value of products there is a loss of ₱0.41 with mungos, and gains of ₱1.45 and ₱.64 with corn and rice, respectively.

The above discussion of gains and losses may be summarized by the following table:

TABLE IV

	Mungos	*Corn*	*Rice*
Native	−₱.84	+₱1.23	+₱.61
Black Orpington, m-Mestizo	−.03	+1.58	+.75
White Leghorn Mestizo	−.41	+1.45	+.64

NOTE:—Figures with the minus sign are losses. The figures for the native hens are averages resulting from the different prices per dozen. The figures with plus signs are gains.

Although mungos gave the highest total production of all the three feeds there was a loss incurred by each breed, as shown in Table IV. On the other hand, corn which is second to it in total production gave a gain in every case higher than rice. This is due to the fact that the market value of corn per cavan is less than 1/3 that of mungos, and a little less than that of rice. The market value of mungos, then, although they were found to be the most efficient for egg production, makes their sole use in poultry unjustifiable. They might, however, be used with advantage in a mixed ration, especially if raised by the farmer himself.

In Table IV it may be noticed that the gains made by the Black Orpington and White Leghorn mestizo hens are larger than those made by the native hens with the same feeds. This is due to the lower prices which the eggs of the native hens bring.

Table V is a comparison of the total production of the three breeds with each ration. It may be easily seen that the native hens gave the highest total production with corn and rice. With mungos, the Black Orpington mestizo hen gave the highest and the native hen the lowest. With rice, the Black Orpington and White Leghorn hens gave the same total production but with corn the former gave the higher.

TABLE V

COMPARISON OF BREED EFFICIENCY IN EGG PRODUCTION BASED ON THE AVERAGE PRODUCTION PER HEN

Month	*Corn*			*Rice*			*Mungo*		
	White Leghorn Mestizo	*Black Orpington Mestizo*	*Native*	*White Leghorn Mestizo*	*Black Orpington Mestizo*	*Native*	*White Leghorn Mestizo*	*Black Orpington Mestizo*	*Native*
March	10.0	13.2	8.9	9.0	9.2	10.6	6.6	8.6	4.0
April	8.4	9.0	6.5	7.0	7.6	9.8	10.4	10.2	8.8
May	3.0	6.6	4.7	6.4	6.6	3.6	6.8	6.0	7.1
June	6.8	5.2	5.0	5.4	3.8	6.9	5.4	6.2	6.9
July	7.0	4.8	7.6	6.8	5.8	6.9	7.6	5.8	7.6
August	4.0	2.0	4.5	8.8	6.0	4.2	5.8	6.2	8.2
September	5.2	3.8	7.1	5.0	5.0	7.5	4.4	2.4	3.9
October	5.2	3.6	6.5	1.8	0.5	1.55	7.0	4.25	5.66
November	4.6	7.0	7.2	1.0	5.25	5.6	9.0	11.5	8.1
December	5.0	7.4	5.0	3.8	5.25	6.0	5.6	12.0	6.1
TOTAL	59.2	62.6	63.0	55.0	55.0	62.65	68.6	73.15	66.36

A DESCRIPTION OF THE EGGS

On October 1st, 1915, a comparison of the eggs from the different lots was made as to length, circumference, weight, shape, and color. The object of this was to find out the differences between the eggs in these respects, as a result of the three rations. To secure fair averages for comparison, 30 eggs from each lot were described.

Table VI is a summary of work on description of eggs. In this table it appears that the eggs of both the native and the Black Orpington mestizo hens fed with rice, stand first as to length, circumference, and weight. In the former, that with mungos stands second in weight and circumference but is excelled by that with corn in length. In the latter, that with mungos, likewise, stands second, except in circumference. In the case of White Leghorn mestizo hens, on the other hand, that with corn stands first in all three respects and is followed by that with rice.

According to the above comparisons, while rice gave practically the lowest total production of eggs in all the three breeds, it produced eggs first in size and weight, except in the case of the White Leghorn hens, as previously noted.

As to shape, there was uniformity in this respect in all the three breeds. As to color, it was the same in all cases in the Black Orpington, while it was not constant in the others.

TABLE VI

DESCRIPTIONS OF EGGS

(*Length and circumference are in millimeters and weight in grams.*)

	NATIVE		*Black Orpington*			*Mestizo*	*White Leghorn Mestizo*		
	Lot II Corn	*Lot III Rice*	*Lot V Mungo*	*Lot I Corn*	*Lot IV Rice*	*Lot VII Mungo*	*Lot VIII Corn*	*Lot IX Rice*	*Lot VI Munfio*
Length	49.6	49.6	48.7	52.6	55.5	53.8	52.7	50.7	49.7
Circumference	121.9	124.2	122.6	122.5	125.3	122.0	122.1	121.7	120.5
Weight	41.2	42.1	41.4	45.3	47.9	45.7	45.7	43.8	42.3
Shape	oblong	oblong	oblong	oblong	oblong	oblong	oblong	oblong	oblong
Color	brown or white	generally brown	generally brown	brown	brown	brown	white or brown	generally white	white or brown

TABLE VII

COMPARISON OF THE WEIGHTS OF EGGS OF EACH BREED FED WITH THREE KINDS OF FEEDS

(Weights in grams)

	Native			*Black Orpington Mestizo*			*White Leghorn Mestizo*		
	Corn	*Rice*	*Mungo*	*Corn*	*Rice*	*Mungo*	*Corn*	*Rice*	*Mungo*
Average Wt. per egg	41.2	42.1	41.4	45.3	47.9	45.7	43.8	42.3	41.1
Weight of one dozen	494.4	505.2	496.2	543.6	574.8	548.4	525.6	507.6	493.2

TABLE VIII

COMPARISON OF THE WEIGHTS OF EGGS OF THE DIFFERENT BREEDS FED WITH EACH KIND OF FOOD

(Weights are in grams)

	Corn			*Rice*			*Mungo*		
	Native	*Black Orpington Mestzo*	*White Leghorn Mestizo*	*Native*	*Black Orpington Mestizo*	*White Leghorn Mestizo*	*Native*	*Black Orpington Mestizo*	*White Leghorn Mestizo*
Average Wt. per egg	41.2	45.3	43.8	42.1	47.9	42.3	41.4	45.7	41.1
Weight of one dozen	494.4	543.6	525.6	505.2	574.8	507.6	496.8	548.4	493.2

Tables VII and VIII are given to show the weights of eggs per dozen calculated from the average weights of the individual eggs.

Table IX is a comparison of the individual eggs of the three breeds as to length, circumference and weight. The figures given are averages derived from Table VI. According to these figures, the Black Orpington egg is considerably the largest in all respects, and that of the native hen the smallest, except in circumference, in which the eggs of the native excel that of the White Leghorn.

THE MORTALITY OF HENS

During September two Black Orpington mestizo hens belonging to Lots IV and VII, respectively, died. During the following month two native hens belonging to Lots III and V, respectively, died.

These deaths occurred in the lots in which the rations given were mungos and rice. There was not any mortality in the lots where the ration given was corn. It may also be mentioned that no deaths occurred among the White Leghorn mestizo hens.

The causes of the mortality are not known. The hens were found dead on the dropping boards.

As a precaution, all the houses were thoroughly disinfected with creolin. Likewise, the bodies of the dead hens were also disinfected with creolin and the same carefully buried.

Throughout the experiment, the pens were thoroughly cleaned in order to destroy any source of danger.

It should be noted that the mortality among native poultry in general is normally much higher than the mortality of the chickens worked with in this experiment.

FEEDING EXPERIMENTS WITH BLACK ORPINGTON MESTIZO CHICKS

The object of this experiment was to compare the effect of a mixed ration with those used singly.

TABLE IX

TOTAL FOR BREEDS, REGARDLESS OF FEEDS

	Native	*B. Orp. Mestizo*	*W. Leghorn Mestizo*
Length	49.3 mm.	53.96 mm.	51.01 mm.
Circumference	122.9 mm.	123.2 mm.	121.4 mm.
Weight	41.5 grams	46.3 grams	43.9 grams

TABLE X

FEEDING EXPERIMENTS WITH BLACK ORPINGTON

Feeds	*Average weekly growth*	*Mortality*
Corn	11.19 grams	20%
Rice	23.90 grams	20%
Mungo	16.12 grams	80%
Mixed rations	37.02 grams	10%

The rations used were the same as those previously used (corn, rice and mungos), except that, aside from testing these singly, a mixed ration composed of the three was tested.

On account of the lack of materials to make up four lots of 10 chicks each, these rations were not tested at the same time. Although this was the case, the same procedure as to feeding and care was followed throughout.

The chicks used were progeny of the Black Orpington mestizo hens used in the present studies. The chicks were put in the rearing pens and numbered by means of ribbon tags small enough so as not to be burdensome to them.

The feeding of the chicks with the ration began on the third day after hatching. During the first two days hard boiled eggs were given. Even after this time boiled eggs were still given, but mixed thoroughly with the ration. This practice was discontinued after one week.

During the course of the feeding, charcoal, finely ground bone, clean water, and green feeds, consisting of corn, sorghum, and Guinea grass were furnished at all times. The rations were finely ground when the chicks were just a few days old. They were made coarser and coarser as the chicks grew older. The ration was sometimes boiled for the sake of variation.

Feeding was done three times a day during the first three weeks. Thereafter it was done twice a day only. Each lot of chicks was left to the care of the mother for about a month, after which they were separated. The pens were cleaned twice a day and disinfected with creolin solution once a week. The feeding and drinking pans were also kept clean.

The chicks were weighed weekly beginning with the first day after hatching. The results are summarized in Table X. The mortality is likewise shown in this table.

As may be noted, the experiment was carried on eleven weeks, except in the case where mungos were fed, which was six weeks. The reason for the discontinuance of the latter feed was the high per cent of mortality, probably due to the inability of the young chicks to digest the mungos properly.

It may be seen from Table X that the greatest beneficial effect is evident in the mixed ration, the average weekly growth being the highest and the percentage of mortality the least. Rice ranks second to the mixed ration in average weekly growth and is equal to corn in mortality. Mungos gave the highest percentage of mortality, but rank third in average weekly growth. Corn gave the lowest weekly growth, the per cent of mortality being trivial as compared to that of mungos.

FEEDING EXPERIMENTS WITH NATIVE CHICKS

The experiments had the same object as the previous one, with the exception that mungos were tested only in combination with other feeds. The chicks used were the offspring of the native hens used in the previous studies.

This experiment is identical with the previous one in treatment and procedure. For this reason the results only are described here. The weighing was extended to eleven weeks.

Table XI summarizes the results. According to the figures, the greatest gain is evident in the mixed ration; however, this is not so well marked as that obtained with the experiments on

the Black Orpington mestizo chicks. The figures further show that rice is second in average weekly growth and corn the last, but rice gave the highest percentage of mortality.

TABLE XI

FEEDING EXPERIMENTS WITH NATIVE CHICKENS

Feeds	*Average weekly growth*	*Mortality*
Rice	17.88	50%
Corn	16.01	20%
Mixed rations	20.48	20%

Both of the last feeding experiments show a clear advantage in favor of the use of a mixed ration. This is in conformity with long established principles in animal feeding.

FATTENING EXPERIMENTS

The object of these experiments was to find out which of the following feed combinations was the most efficient for fattening chickens.

(1)—Corn, rice and mungos; (2)—mungos and corn; (3)—mungos and rice.

Nine native hens, belonging to the flock used in the former work, were used in this experiment. These were divided into three groups of three each.

The rations were unground, but thoroughly mixed before giving them to the hens. They were occasionally boiled for the sake of variation. Feeding was done three times a day. Green feeds, charcoal, ground bone and clean water were supplied at all times.

The pens were cleaned thoroughly twice a day. This experiment began on January 4, 1916, and was continued for six weeks. The hens were weighed twice a week.

Table XII gives a summary of the experimental results. It shows the average growth per hen. According to the figures, the mixed ration gave the highest average growth, it being 0.192 kilogram and mungo and rice second, it being 0.177 kilogram. Mungos and corn gave the lowest, 0.070 kilograms.

TABLE XII

Tables	*Feeds*	*Average growth per hen in six weeks.*
	Corn, rice and mungo	0.192 kg.
	Mungo and corn	0.070 kg.
	Mungo and rice	0.177 kg.

CONCLUSIONS

1. From the figures obtained in the first part of the experiment no definite conclusion can be drawn as to which of the three rations used, corn, rice or mungos, is the most efficient for the growth of hens.

2. Of the three rations used, mungos gave the highest total production of eggs during the course of the experiment, but due to their high market price there was a loss incurred in every case. This makes their sole use in poultry work unjustifiable. They might, however, be used with advantage if raised by the farmer himself. The greatest profit was realized from corn, due to its comparatively low price.

3. With the same feeds, the lowest gains and highest loss were obtained with the native hen.

4. With corn and rice the native hen gave the highest total production of eggs, but with mungos it gave the lowest.

5. In both of the two feeding experiments with chicks, the mixed ration gave the highest average growth per chick per week and the comparatively lowest percentage of mortality.

6. In the fattening experiments with hens, corn, rice, and mungos combined, gave the highest average growth per hen in six weeks.

BIBLIOGRAPHY

1. Lewis, Harry R., Poultry Keeping, (1915).

2. Allarey, Vicente F. The Philippine Chicken.

The PHILIPPINE AGRICULTURIST AND FORESTER (1912) **2**, 49-59.

3. Bureau of Customs, Manila, P.I., Reports for the Years 1911-1914.

4. Kansas Experiment Station, Bull. 164 (1910).

COLLEGE AND ALUMNI NOTES

Messrs. José M. Mendoza, Basilio Farinas, Vicente Romero, Felix Manipol and Serapio Palofox, formerly students in this college, have entered the National Guard and are now under training at Fort McKinley. Messrs. Severo M. Capistrano, '15, and José M. Trinidad, '18, have also entered the National Guard.

Prof. B. M. Gonzalez, for several years business manager of this paper and to whose able management this publication owes much of its success, has resigned in order to be able to devote more time to his other work.

Nemesio Blanco Mendiola, B. S. Agr., 1914; M. S., 1916; and Ph. D., 1918 (Cornell), has recently returned to the Philippines from the United States and has reported for duty as instructor in agronomy in the College of Agriculture. Dr. Mendiola spent two years as a fellow of the University of the Philippines in Cornell University, where he specialized in plant breeding. Previous to his return to the Philippines, he was elected a member of the *Sigma Xi*.

Occupation Day was celebrated by the faculty and students of this college with appropriate ceremonies. Assistant Professor Elayda and Dr. Mendiola were the principal speakers.

Mr. Vicente F. Allarey, '12, provincial agricultural inspector of the Bureau of Agriculture, with station at Lucena, Tayabas, who married Miss Vicenta S. Racelis, a graduate of the Philippine Normal School, during the latter part of last year, is now the proud father of a baby boy.

The class in animal husbandry made a trip to Lipa, Batangas, for the purpose of studying the fine type of native ponies for which that place has long been famous.

The Philippine Society of Technical Agriculturists, a body composed of alumni of this college and of other agricultural colleges abroad, held its semi-annual meeting and banquet at the College Campus on the eighteenth of August. General Emilio Aguinaldo, Mr. Charles W. Hamilton, president of the Visayan Refining Company, Acting Dean C. F. Baker, of this college, and Mr. José Sanvictores, Assistant Director of Agriculture and president of the society, were among the principal speakers at the banquet.

Mr. Nicanor G. Teodoro, '15, has recently been placed in charge of the section of fiber investigation of the Bureau of Agriculture.

Mr. Toribio Vibar, '12, until recently supervising teacher in the employ of the Bureau of Education at Guinobatan, Albay, has been appointed instructor in agronomy at this college and has already reported for duty. Mr. Vibar's place as supervising teacher has been taken over by Mr. Felipe O. Cevallos, '12.

A delegation of the Fourth Agricultural Congress visited the College of Agriculture on the twenty-fifth of August. The different departments of the college were thrown open for their inspection, and a substantial lunch was served at noon.

Mr. Arsenio A. Goco, '17, plant inspector of the Bureau of Agriculture, was detailed for duty at this college for a few days in order to confer with the college authorities as to effective methods of control for the pink disease of citrus (*Corticium salmonicolor*), a disease of very recent introduction in the Philippines, presumably by way of imported citrus buds, and now rapidly establishing itself to the extent of menacing the citrus industry in this country.

Dr. Nemesio B. Mendiola, editor-in-chief of this paper prior to his departure for the United States, has recently been appointed business manager to succeed Prof. Gonzalez.

ERRATA

The Philippine Agriculturist and Forester (1917) **6**:98; Weather observation, August, 1917, under date August 12, col. 6, Daily Mean Temperature, instead of 27.3 read 26.9. P. 99, Weather observation, Sept. 1917, under date Sept. 5, col. 2, Rainfall daily, instead of 18.5, read 18.3. Under date Sept. 14, col. 7, Wind in Miles daily, instead of 29.4, read 20.4. Under date Sept. 22, col. 13, Insolation daily, instead of 5.8, read 5.9.

Vol. VI, Nos 5-6, p. 181, Weather observation, total rainfall during the month of Oct., instead of 243.7, read 246.7. Sept. 29 to Oct. 6, College Coffee Plantation, Weather observation, minimum temperature, col. 5, instead of 19.98, read 19.8.

Oct. 27 to Nov. 3, College Coffee Plantation and summit of Mount Maquiling, Weather observation, weekly rainfall maximum and minimum temperature and weekly mean are missing. They are as follows:

COLLEGE COFFEE PLANTATION

Date	*Rainfall Weekly*	*Temperature Max-imum*	*Temperature Min-imum*	*Mean Weekly*
Oct. 27 to Nov. 3	48.5	28.8	21.0	21.9
	Summit of Mount Maquiling			
Oct. 27 to Nov. 3	60.0	21.0	18.8	19.9

Fourth Annual Exposition

of the

College of Agriculture

Los Baños

November 30th and December 1st

1918

Book Review

SPECIES BLANCOANAE, A CRITICAL REVISION OF THE PHILIPPINE SPECIES OF PLANTS DESCRIBED BY BLANCO AND BY LLANOS, BY E. D. MERRILL

(*Department of Agriculture and Natural Resources, Bureau of Science, Publication No. 12, 15 June 1918. Manila, Paper, 8°, Pp. 423, 1 Map.*)

Even more than in his Interpretation of Herbarium Amboinense of Rumphius, Professor Merrill has placed the student of Philippine botany in his debt by this latest work which has done for Systematic Botany what some painstaking soul must some day do with Elera's "Catalogo de toda la Fauna Filipina", although in the latter case the task will be far more trying, due to lack of descriptive matter, plates or collectors' comments in Elera's work.

In the present work Merrill, while following the most modern taxonomic sequence, has given under the genus at present accepted, first Blanco's, Llanos's, Fernandez-Villar's, or Naves's specific combination and afterwards in bold capitals, the combination as at present interpreted by himself or other modern writers and it would be surprising to one not knowing the botanic acumen of the author to note the great proportion of these combinations which is Merrill's. Of course where Blanco's genera and species remain unchanged that fact is indicated by the bold capitals at the paragraph heading. This is a great aid to one, who, using the present work as a reference for the plant name only, can at once get the combination he requires without overmuch searching.

While the "Exsiccata Species Blancoanae" was a happy enterprise on the part of this author, it certaily finds its culmination of usefulness when accompanied by the present work, and one having access to both the *Exsiccata* and the volume here discussed is in a position to know what 95 per cent of Blanco's plants really are. This is of value to naturalists, other than botanists, whose work also depends upon a certain familiarity with the commoner Philippine plants.

Blanco made much use of Filipino names of plants and it is to be regretted that the present work contains no index to those made use of therein. Of course, this book is not a "Manual" and the lack is supplied in large measure in the "Flora of Manila" by the same author, yet such an inclusion of vernacular names in the index would have well repaid the extra work involved, especially in its value to the non-botanist.

Had the numbering of the specimens in the *Exsiccata* been deferred until the full series of plants had been obtained it is probable that these numbers could have been made to represent more nearly the relative abundance of a given species than they do in the present book, but this would undoubtedly have hindered other more valuable work in places where these sets have been sent and this is compensated for by the very full statements of habit, habitat, distribution and uses given by the author under each specific discussion.

It is not plain why *Cubilia blancoi* Blume (p. 240) should not be *Cubilia cubili* Blanco. It is also not clear why *Samanea saman* Merr. (p. 13) is indicated as the correct name, if Bentham described the species.

In glancing through this book one finds one's respect for the work of Blanco increasing, in view of his own statement of lack of capacity as a botanist; at the same time one feels that Merrill by his painstaking effort has virtually recreated a "Flora de Filipinas" which can be used as an authoritative reference in so far as concerns the species dealt with by the "Father of Philippine Botany."

—CHARLES S. BANKS.

Weather Observations, March, 1918

OBSERVER—V. RAVARA

Date Feb.	Rainfall mm. Daily	Rainfall mm. Weekly	Temperature in °C Maximum	Temperature in °C Minimum	Temperature in °C Mean	Wind in Miles Weekly mean	Wind in Miles Daily	Wind in Miles Weekly	Cloudiness	Atmometer Reading in C. C. Evaporation Daily	Evaporation Weekly	Insolation Daily	Insolation Weekly
23	0.		24.6	20.6	22.6		72.4		Clear	34.3		4.1	
24	T		24.0	18.6	21.3		70.4		"	27.3		4.2	
25	T		23.9	21.2	22.5		54.1		½ cloudy	20.7		1.4	
26	5.9		26.6	21.6	24.1		61.5		"	19.4		4.3	
27	0.3		28.2	21.9	25.1		54.7		Clear	33.5		6.4	
28	0		27.4	21.7	24.5		63.6		"	36.8		5.6	
March													
1	0	6.2	27.8	21.1	24.4	23.5	63.2	439.9	½ cloudy	30.8	202.8	2.8	28.8
2	0		26.4	21.7	24.1		91.5		¾ "	33.8		2.9	
3	0		25.8	21.9	23.8		91.4		½ "	30.2		2.0	
4	0.2		25.0	20.7	23.8		58.1		¾ "	23.6		3.3	
5	0		27.9	22.1	25 0		77.1		¾ "	40.0		2.1	
6	T		25.3	22.7	24.0		58.5		"	25.7		.2	
7	0		26.1	22.1	24.1		75.9		"	28.7		.9	
8	0	0.2	25.2	22.2	23.7	24.1	37.3	489.8	"	22.3	204.3	2.1	13.5
9	4.1		25.0	22.2	23.6		29.7		¾ "	14.8		4.2	
10	0.5		27.5	21.8	24.6		31.4		½ "	23.0		.9	
11	10.8		27.8	21.6	24.7		64.6		"	24.7		4.0	
12	0.2		27.4	21.8	24.6		50.5		½ "	28.8		2.9	
13	2.5		26.9	21.6	24.2		24.0		¾ "	16.0		5.2	
14	0.2		28.9	21.4	25.1		26.4		½ "	23.1		4.3	
15	0.3	18.6	28.8	21.6	25.2	24.5	59.6	286.2	½ "	27.5	157.9	4.5	26 0
16	0		26.6	21.8	24.2		47.0		½ "	25.6		1.6	
17	0		26.9	21.8	24.3		69.0		Clear	30.8		.4	
18	0		28.0	21.5	24.7		64 6		"	31.0		2.1	
19	0		28.4	20.8	24.6		53.0		"	37.1		4.8	
20	0		28.4	20.9	24.6		58 4		"	36.6		1.8	
21	0		28.2	20.2	24.2		51.4		"	35.3		1.7	
22	0	0	29.3	20.4	24.3	24.4	44.6	388.0	"	36 7	233.1	3.0	15 4
23	0		25.5	21.8	23.6		66.0		"	38.4		7.3	
24	0		31.2	21.7	26.4		44.0		"	38.8		4.9	
25	0		32.6	20.9	26.4		37.6		"	35.1		3.1	
26	0		32.0	21.8	26.9		32.0		"	32.7		2.7	
27	0		30.0	23.2	26.6		52.1		"	41.8		3.3	
28	0.5		29.2	22.8	26.0		86 3		"	24.2		2.9	
29	0	0.5	29.4	22.7	26.0	25.9	69.6	387.6	"	35.2	246.2	3.4	27.6
30	0		30.3	21.9	26.1		60.1		"	29.4		3.1	
31	2.0		26.1	23.7	24.9		45.3		½ cloudy	19.6		1.7	
Month		27.5				24.7		17.202			921.3		90.1

	College	Coffee	Plantation	
23–2	10.3	27.5	16.1	21.8
2– 9	1.6	26.0	18.0	22.0
9–16	15.0	28 8	18.5	23.6
16–23	T	28.8	17.5	23.1
23–30	1.0	30.4	19.2	24.8
	Summit of Mount Maquiling			
2– 9	14	17.3	15.8	16 5
9–16	11	19.1	17.1	18.1
16–23	25	18.4	15.5	16.9
23–30	2	23.0	16.3	19 8

The month was dry, windy and clear. After two rather dry preceding months the one moderate rain on March 11 had little influence in relieving the drought.

F. T. McLean,
Associate Professor of Plant Physiology.

Weather Observations, April, 1918

OBSERVER—V. RAVARA

Date Mar.	Rainfall mm. Daily	Rainfall mm. Weekly	Temperature in °C Maximum	Temperature in °C Minimum	Temperature in °C Mean	Wind in Miles Weekly mean	Wind in Miles Daily	Wind in Miles Weekly	Cloudiness	Atmometer Reading in C. C. Evaporation Daily	Evaporation Weekly	Insolation Daily	Insolation Weekly
30	0		30.3	21.9	26.1		60.1		Cloudy	29.4		3.1	
31	2.0		26.1	23.7	24.9		45.3		½ "	19.6		1.7	
April													
1	3.0		28.3	22.2	25.2		52.0		¾ "	23.8		4.4	
2	0		29.7	21.8	25.7		65.0		Clear	26.9		4.3	
3	0		29.9	23.4	26.6		72.1		"	28.2		6.8	
4	0		29.0	22.8	25.9		78.0		"	15.3		2.6	
5	0	3.0	28.9	22.7	25.8	25.7	78.6	451.1	"	24.0	167.2	5.4	28.3
6	0		29.0	22.4	25.7		54.5		"	22.2		3.4	
7	0		30.7	23.6	27.1		47.2		"	22.6		4.6	
8	0		31.3	22.9	27.1		54.1		"	24.8		3.7	
9	0		31.6	22.7	27.1		41.3		"	51.5		8.6	
10	0		32.0	22.4	27.2		29.2		"	43.3		9.9	
11	0		31.4	22.8	27.1		59.2		"	50.4		6.3	
12	0	0	30.9	22.9	26.9	26.9	64.3	349.8	"	45.1	259.9	7.2	43.7
13	0		31.6	21.7	26.6		30.5		"	44.2		8.5	
14	0		31.9	22.9	27.4		23.4		"	38.6		6.7	
15	1.9		25.2	24.4	24.8		30.1		"	13.1		3.0	
16	0		29.7	23.0	26.3		40.9		Cloudy	36.1		8.0	
17	0		29.5	23.8	26.6		45.6		¾ "	42.8		7.7	
18	0		27.4	22.8	25.1		58.6		Clear	43.5		4.4	
19	0	1.9	30.3	23.2	26.7	26.2	69.2	298.3	"	47.0	265.3	5.2	43.5
20	0		30.3	21.9	26.1		70.6		½ Cloudy	51.3		4.5	
21	0		29.7	22.4	26.0		51.0		Clear	45.8		2.7	
22	.4		32.8	23.0	27.9		24.8		"	36.1		5.0	
23	5.4		31.6	22.3	26.9		18.6		"	41.6		3.0	
24	2.0		29.0	24.2	26.6		121.7		Cloudy	26.4		3.9	
25	11.4		29.0	23.9	26.4		30.5		Clear	18.9		3.5	
26	1.1	20.3	29.7	23.7	26.7	26.7	24.0	341.2	Cloudy	20.2	240.3	4.1	26.7
27	0.7		30.1	22.9	26.5		20.5		"	22.5		4.2	
28	1.6		31.2	23.8	27.5		26.8		Clear	30.4		2.4	
29	T		31.7	22.8	27.2		37.3		"	43.6		4.2	
30	0		31.1	24.0	27.5		51.9		"	37.9		0.8	
Month		27.5				26.5		1471.5			1018.1		149.0

March	College	Coffee	Plantation	
30– 6	6.6	28.0	18.2	23.1
6–13	0	30.5	19.0	24.7
13–20	2.5	28.9	19.4	24.1
20–27	30.3	29.8	19.3	24.5
27– 4	12.8	29.8	19.2	24.5

	Summit of Mount Maquiling			
30– 6	1.5	19.1	17.6	18.3
6–13	0	19.8	16.9	18.3
13–20	2.0	20.7	17.5	19.1
20–27	36.8	20.4	17.8	19.1
27– 4	9.5	20.6	17.9	19.2

Contrary to usual experience, April was as rainy as March, but was hotter and nearly as windy, so that the general effect was distinctly dry, as was to be expected at this season.

F. T. McLean,
Associate Professor of
Plant Physiology.

Weather Observations, May, 1918

OBSERVER—V. RAVARA

Date	Rainfall mm		Temperature in °C				Wind in Miles		Cloudiness	Atmometer Reading in C.C. Evaporation		Insolation	
April	Daily	Weekly	Maximum	Minimum	Mean	Weekly mean	Daily	Weekly		Daily	Weekly	Daily	Weekly
28	1.6		31.2	23.8	27.5		26.8		Clear	30.4		2.4	
29	T		31.7	22.8	27.2		37.3		"	43.6		4.2	
30	0		31.1	24.0	27.5		51.9		"	37.9		.8	
May													
1	0		31.6	22.8	27.2		52.9		"	45.2		10.9	
2	4.1		30.4	24.4	27.4		55.4		"	33.1		9.7	
3	1.6		31.0	23.6	27.3		56.6		"	33.7		8.4	
4	0	7.3	31.8	24.0	27.9	27.4	51.8	332.7	"	45.5	269.4	13.4	48.8
5	0		31.4	23.9	27.6		52.0		¾ Cloudy	43.0		6.9	
6	0		30.9	25.3	28.3		62.8		Clear	39.7		7.3	
7	0		31.7	23.8	27.7		48.8		"	42.9		5.8	
8	0.2		31.3	23.8	27.5		33.7		¾ Cloudy	35.2		——	
9	0		32.7	23.9	28.3		19.4		Clear	30.9		——	
10	5.0		30.7	23.8	27.2		15.8		Cloudy	21.6		——	
11	T	5.2	31.8	23.6	27.7	27.7	43.4	275.9	Clear	41.8	255.1	6.5	26.5
12	0.9		30.0	24.0	27.0		27.5		½ Cloudy	30.1		4.8	
13	14.4		28.0	24.9	26.0		22.7		Fair	13.7		1.3	
14	12.8		29.8	23.6	26.7		39.3		¾ Cloudy	23.7		2.2	
15	T		31.0	23.8	27.4		32.2		¼ "	32.1		0.3	
16	0		31.4	23.8	27.6		38.3		Clear	38.1		8.7	
17	0.4		31.7	24.4	28.5		36.1		½ Cloudy	35.8		8.1	
18	21.8	50.3	30.8	23.6	27.2	27.2	17.0	213.1	¼ "	22.7	196.2	8.7	34.1
19	0.2		31.4	23.9	27.6		20.7		Clear	25.4		10.7	
20	0		32.0	23.9	27.9		41.7		Clear	41.3		7.9	
21	0		32.0	24.0	28.0		33.6		"	35.3		6.6	
22	0		33.2	23.6	28.4		23.8		¼ Cloudy	39.5		6.6	
23	0		32.4	23.5	27.9		35.0		Clear	37.0		4.6	
24	1.5		31.8	24.6	28.2		49.5		¼ Cloudy	36.3		2.3	
25	0	1.7	32.0	22.7	27.8	27.8	50.1	254.4	Clear	33.8	248.6	3.1	41.8
26	0.5		31.8	23.8	27.8		42.7		½ Cloudy	29.9		2.1	
27	6.2		32.8	24.0	29.4		39.0		½ Cloudy	23.0		3.2	
28	1.3		30.9	23.6	27.2		43.2		Clear	21.0		4.9	
29	3.6		32.8	23.7	28.2		30.5		¼ Cloudy	28.6		1.3	
30	2.9		32.1	24.7	28.4		26.9		"	29.9		1.1	
31	7.6		32.0	22.5	27.2		43.2		½ "	25.8		0.7	
Month		85.0				27.7		1186.6			1015.6		158.1

College Coffee Plantation

27– 4	12.8	29.8	19.2	24.5
4–11	5.4	29.4	21.1	25.2
11–18	47.0	29.3	21.0	25.2
18–25	13.7	31.4	20.2	25.8
25– 1	40.0	30.5	21.7	26.1

Summit of Mount Maquiling

27– 4	9.5	20.6	17.9	19.2
4–11	2.6	22.3	19.8	21.0
11–18	40.4	20.8	18.8	19.8
18–25	8.5	24.2	20.0	22.1
25– 1	37.1	23.8	20.1	21.9

The first two weeks of this month continued dry, the drought being effectively broken on May 13 by heavy rain. May was also the hottest month of the year. Wind and evaporation were, however, moderate, and the last two weeks were favorable for planting.

F. T. McLean,
Associate Professor of
Plant Physiology.

Weather Observations, June, 1918

OBSERVER—V. RAVARA

Date June	Rainfall mm Daily	Rainfall mm Weekly	Temperature in °C Maximum	Temperature in °C Minimum	Temperature in °C Mean	Temperature in °C Weekly mean	Wind in Miles Daily	Wind in Miles Weekly	Cloudiness	Atmometer Reading in C.C. Evaporation Daily	Evaporation Weekly	Insolation Daily	Insolation Weekly
1	.5	22.6	30.0	24.5	27.2	27.9	19.4	245.5	Clear	26.7	184.8	6.8	15.3
2	0		31.7	24.0	27.8		39.2		"	29.1		6.7	
3	0		31.8	23.7	27.7		54.1		¼ Cloudy	38.6		8.6	
4	0		31.6	24.2	27.9		61.6		¼ "	41.6		8.1	
5	9.2		31.1	23.8	27.4		40.3		½ "	28.9		6.8	
6	1.7		29.0	23.2	26.1		30.7		Clear	17.0		4.6	
7	3.9		29.9	23.8	26.8		70.2		"	33.3		6.1	
8	8.4	23.2	29.7	25.4	27.5	27.3	58.4	354.5	Fair	24.9	213.4	4.2	46.0
9	25.3		30.6	22.4	26.5		34.1		"	14.2		4.5	
10	6.0		28.0	23.6	25.8		27.7		½ Cloudy	12.9		3.8	
11	7.1		28.6	22.9	25.7		25.4		½ Cloudy	8.1		3.2	
12	0.7		30.4	22.7	26.5		24.8		Fair	22.6		5.2	
13	0		31.0	23.6	27.3		36.0		"	33.3		6.8	
14	0.8		32.0	24.0	28.0		20.5		½ Cloudy	22.4		4.8	
15	20.2	60.1	30.4	24.5	27.4	26.7	22.5	191.0	½ "	16.3	129.8	4.3	32.6
16	0.5		31.6	23.7	27.6		36.6		Clear	23.3		6.6	
17	0		31.5	24.6	28.5		33.1		½ Cloudy	20.6		3.2	
18	9.5		29.1	23.0	26.0		19.3		Clear	17.3		4.5	
19	17.0		29.9	23.1	26.5		13.5		Fair	17.9		4.2	
20	2.6		29.4	23.8	26.6		32.5		Cloudy	16.3		3.8	
21	0.5		29.8	23.7	26.7		29.5		Fair	23.7		5.7	
22	0	30.6	29.1	23.8	26.4	26.9	10.9	175.4	½ Cloudy	20.7	139.8	5.1	32.1
23	T		31.1	24.1	27.6		17.7		Clear	28.3		6.3	
24	T		31.4	23.6	27.5		19.0		"	26.0		4.9	
25	0		31.6	23.4	27.5		28.5		"	31.0		7.0	
26	0		29.6	23.6	26.6		18.4		Fair	22.4		5.1	
27	26.3		27.0	23.5	25.2		82.5		Cloudy	8.6		3.8	
28	23.5		25.5	24.8	25.1		263.0		"	11.7		3.1	
29	155.6	205.4	25.4	22.7	24.0	26.2	386.0	815.1	"	3.9	131.9	1.7	31.9
30	176.0		27.8	23.9	25.8		102.9		Cloudy	19.5		5.8	
Month		495.8				26.8		1658.3			661.1		155.2

	College Coffee Plantation			
1– 8	43.8	29.6	20.6	25.1
8–15	44.1	30.3	20.2	25.2
15–22	64.5	30.0	20.8	25.4
22–29	288.8	30.4	20.3	25.3

	Summit of Mount Maquiling			
1– 8	25.3	21.0	19.2	20.1
8–15	26.1	22.4	18.6	20.5
15–22	44.5	21.9	18.9	20.1
22–29	217.0	22.2	19.5	20.8
29– 6				

The entire month was rainy, with low evaporation, moderate wind and insolation. A destructive typhoon occurred on the 28-29.

F. T. McLean,
Associate Professor of
Plant Physiology

Weather Observations, July, 1918

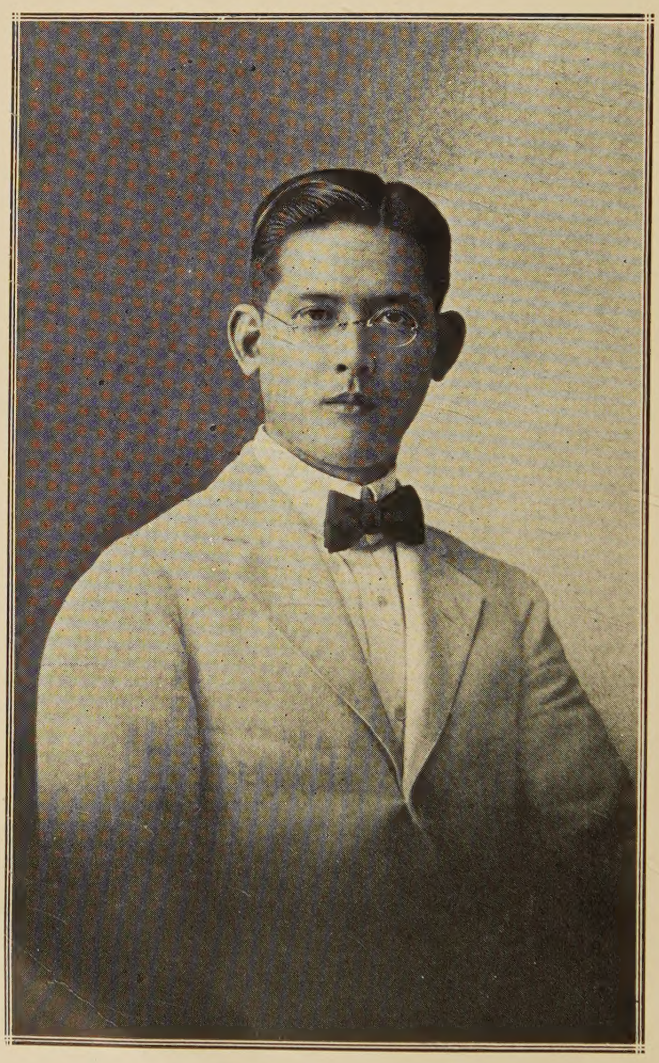
OBSERVER—V. RAVARA

Date July	Rainfall in mm. Daily	Rainfall in mm. Weekly	Temperature in °C Maximum	Temperature in °C Minimum	Temperature in °C Mean Daily	Temperature in °C Mean Weekly	Wind in Miles Daily	Wind in Miles Weekly	Cloudiness	Atmometer Reading in c.c. Evaporation Daily	Evaporation Weekly	Insolation Daily	Insolation Weekly
June													
30	17.6		24.8	23.9	25.8		102.9		Cloudy	19.5		5.8	
July													
1	13.9		30.7	23.7	27.2		27.7		"	18.1		4.4	
2	.2		31.1	23.4	27.2		28.9		Clear	21.2		2.9	
3	0		31.1	22.9	27.0		41.7		Cloudy	22.1		1.9	
4	0		30.0	22.6	26.3		24.8		"	18.6		2.2	
5	8.5		27.7	23.5	25.6		26.2		¾ "	11.4		2.0	
6	2.7	42.9	28.1	22.8	25.4	26.4	19.3	271.5	Cloudy	12.3	123.2	2.3	21.5
7	1.0		29.1	23.2	26.1		29.7		½ "	20.1		3.1	
8	0		27.9	23.7	25.8		70.9		"	26.7		2.3	
9	20.5		26.0	24.1	25.0		104.9		"	15.4		.6	
10	40.6		27.2	23.5	25.3		164.0		Cdy.-Wdy.	15.6		2.0	
11	10.5		28.8	25.0	26.9		268.7		" "	44.1		3.0	
12	.1		30.4	27.6	29.0		223.2		" "	70.4		4.3	
13	0	72.7	29.8	24.8	27.3	26.5	126.2	987.6	" "	37.6	229.9	3.6	18.9
14	4.0		29.8	26.9	28.3		180.0		" "	38.4		3.5	
15	14.9		29.0	25.3	27.1		175.5		" "	33.2		3.0	
16	0		30.2	24.8	27.5		64.7		½ Cloudy	35.2		3.4	
17	1.7		30.5	25.8	28.1		111.2		¾ "	37.3		4.0	
18	2.8		31.0	24.8	27.9		70.5		¾ "	30.7		3.1	
19	T		31.0	24.5	27.7		66.7		Clear	34.9		3.7	
20	0	23.4	31.0	25.6	28.3	27.8	91.4	760.0	"	41.1	250.8	4.1	24.8
21	0		31.1	23.8	27.4		64.2		½ Cloudy	32.7		3.5	
22	0		30.8	26.6	28.7		135.8		¾ "	40.4		3.4	
23	2.5		31.7	23.8	27.7		115.7		Clear	37.1		4.4	
24	0		31.4	24.6	28.0		83.7		"	31.5		3.6	
25	4.7		29.2	24.8	27.0		33.2		Cloudy	18.0		1.8	
26	1.8		26.7	23.5	25.1		27.7		"	22.8		1.7	
27	1.1	10.1	27.2	23.8	25.5	27.1	36.5	496.8	"	12.8	195.3	1.8	20.2
28	19.3		24.8	23.1	23.9		34.1		"	4.7		1.1	
29	7.5		28.6	23.0	25.8		23.1		"	17.9		2.2	
30	.1		30.0	25.6	27.8		62.0		¾ "	25.4		2.0	
31	0		30.5	25.6	28.0		39.4		½ "	36.7		4.3	
Month		158.4				26.9		2571.6			864.4		89.2

	College	Coffee	Plantation	
30– 6	48.5	28.8	20.5	24.6
16–13	105.8	27.0	21.1	24.0
13–20	19.3	28.0	21.8	24.9
20–27	7.5	28.5	21.5	25.0
	Summit of Mount Maquiling			
29– 6	34.2	21.5	18.3	19.9
6–13	89.0	19.5	18.2	18.8
13–20	22.5	19.8	18.7	19.2
20–27	13.0	20.3	18.6	19.4

The cloudy, windy weather from July 9 to 17, accompanied by drought for two weeks, from July 11 to 27, was unfavorable to upland rice, but was not injurious to growing corns or other field crops.

F. T. McLean
Associate Professor of
Plant Physiology.



Honorable BIENVENIDO MARIA GONZALEZ

B. Agr. (U. P., 1913) and M. S. (Wisconsin, 1915)

First Alumnus Member of the Board of Regents of the University of the Philippines.